

**CONSERVATION ASSESSMENT OF
BOX HOLLOW AND SPINIFEX
COMMUNITIES ON THE
PROPERTIES OF 'KURRAJONG'
AND 'BARFIELD'
AT LIGHTNING RIDGE, NSW**

**Prepared by Philip Spark
North West Ecological Services**

**For
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Area 1. Relatively undisturbed Cumborah Spinifex community

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1-0. INTRODUCTION

North West Ecological Services was contracted by NSW Department of Mineral Resources to determine the relative conservation values of the two vegetation communities Box Hollow and Spinifex, in the proposed exploration drilling areas of the properties 'Barfield' and 'Kurrajong'. The two properties adjoin the existing opal fields of Glengarry and Sheeppark, approximately 45 kilometres South West of Lightning Ridge.

The community of Cumborah Spinifex (*Triodia mitchellii*) has been identified in the Northern Floodplain Vegetation report (2004) to be unique and regionally significant. Four thousand seven hundred and ninety hectares (4,790ha) occur in the western division of Walgett shire, of which three hundred and sixty five hectares (365ha) are reserved in Narran Nature Reserve, Northern Floodplain Vegetation report (2004).

The Spinifex community occurring on deep red sand is considered significant because of its rich biodiversity (Maher et al. 1998), its unique species composition, and it provides important habitat for western fauna species at their easterly limit. Appendices 2, 3, 4, & 5 highlight the western species at the eastern limit of their range. The cover provided by spinifex clumps is also of value for the shelter and protection it provides for numerous small mammals, reptiles and invertebrates. Many species also find the sandy soil beneath the clumps ideal burrowing substrate. Because of its unique habitat and species composition it is highly desirable to include more of this community into dedicated conservation reserves.

Box Hollows are small clay depressions in the dry ridge landscape. The local name Box Hollow comes from the dominance of Bimble Box trees. They are unique because they retain water after storm events, providing ephemeral water sources for all fauna, and aquatic/semi aquatic habitat for frogs, invertebrates, waterbirds and plants.

Four areas were assessed to determine the relative conservation value of each, on the 10th of September 2006. Two Box Hollow sites were assessed on the property 'Barfield', one spinifex area 3 km north of Cumborah and another spinifex area on the property 'Kurrajong'.

Acknowledgments: Thanks to Warwick Schofield who provided the background information to the assessment and guided tour of the study areas.

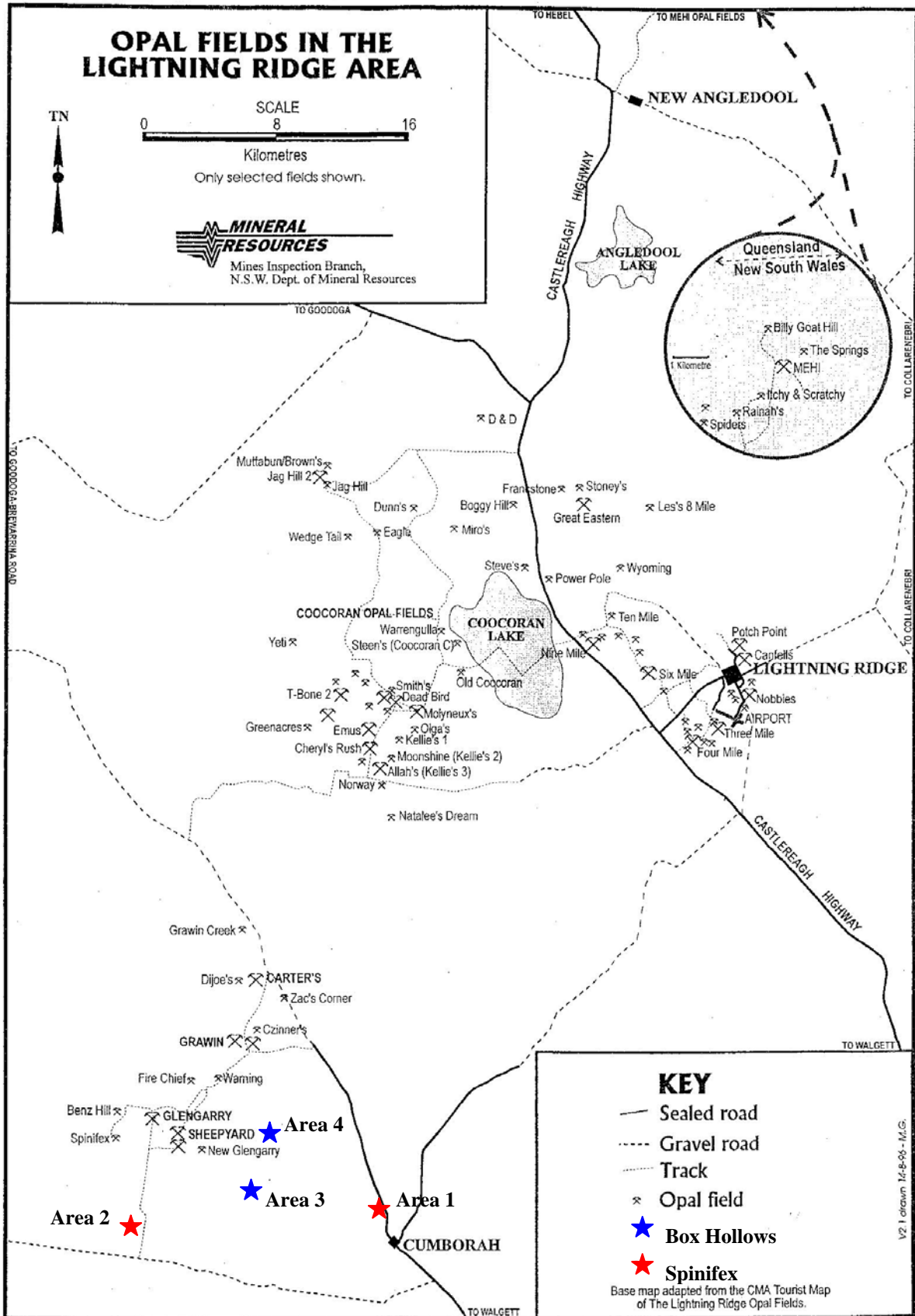


Figure 1. Regional location of areas assessed 10th September 06

2-0. SURVEY METHOD

The conservation assessment was conducted on the 10th of September 2006, by the survey team of Phil Spark (Fauna Ecologist, Tamworth) and Dr Lachlan Copeland, (Botanist, Armidale).

Each area was assessed by randomly walking the sites selected by Warwick Schofield, taking note of the plants present, their abundance and percentage ground cover, the disturbance history, age and size of the trees and shrubs, habitats present (soil type, logs, litter, dead trees, burrows, hollow trees), and any reptiles, mammals and birds heard or observed.

3-0. LIMITATIONS

The region had been in drought for over two years, and very little rain had fallen in the preceding months to stimulate flowering and annual species growth. In addition to that limitation the preceding winter was characterised by numerous freezing nights and mild and dry sunny days.

The weather conditions on the assessment day were cold (7 – 19 degrees centigrade), windy, and drizzly rain fell.

The early spring seasonal timing of the survey also limited the diversity of plants likely to be identifiable.

The unfavourable weather and the early seasonal timing of the assessment were not considered conducive to detecting the diversity of flora and fauna likely to occur. Consequently, the results of the assessment were compromised considerably.

The area assessed was a small fraction of the total area of both communities proposed for exploration drilling. The results from the two Box Hollow areas may be representative of that community, although the same plants may be common elsewhere in floodplain locations. Further surveys could determine the distribution of the plants recorded in the Box Hollows.

The results from the Spinifex community are not likely to be representative of the broader area. Further surveys are required to sample the extent of the spinifex community, to describe its variability, and determine the extent of the threatened orchid *Diuris tricolor*.

4-0. RESULTS

Table 1. Areas assessed 10th September 2006

Area location	Landform Altit	Easting	Northing	Vegetation Community
Area 1 roadside 3 km north of Cumborah	Red sand ridge	572923	6712697	Mature woodland of Silver-leaved Ironbark and White Cypress Pine with sparse Spinifex ground cover
Area 2 the property 'Kurrajong'	Red sand ridge 153 m altit	558733	6712721	Highly disturbed regrowth of Silver-leaved Ironbark and White Cypress Pine <20 cm dbh, with sparse Spinifex ground cover
Area 3 property 'Barfield'	Ridge Box hollow 152 m altit	564913	6714323	Disturbed mature Bimble Box woodland/open woodland, with few White Cypress Pine & Wilga shrubs, sparse grass & herb ground cover.
Area 4 property 'Barfield'	Ridge Box hollow 146 m altit	565914	6717653	Dieback affected regrowth (< 15 cm dbh) of Bimble Box with few White Cypress Pine, sparse ground cover 20-30% of grass and herbs

4-1. Spinifex community

Two areas were assessed and described, and found to be very similar in species composition. Area 1 is thought to be the largest least disturbed area of Spinifex community in the region, which is not included in the area proposed for drilling exploration. It was assessed to determine the relative conservation value of Area 2 by comparing and contrasting its disturbance history, structure, and diversity of plants and habitats. The survey results for spinifex areas 1 and 2 are combined in Appendix 6 and summarised in Appendix 1.



- Area 1 is a relatively undisturbed mature woodland community of Silver-leaf Ironbark (*Eucalyptus melanophloia*), White Cypress Pine (*Callitris glaucophylla*), with sparse tall shrubs > 50 cm, and sparse ground cover plants of low shrubs. Dominantly Spinifex (*Triodia mitchellii*) with a few herbs and grasses. The site assessed is located approx 3 km north of Cumborah. There was no evidence of fire or clearing, and it appeared that grazing had been light for some time. However the preceding drought had killed over 50% of the Spinifex clumps, reducing herbaceous ground cover to 10%, litter 10%, and the remaining 80% being red sandy soil and cryptogamic algae.

Area 2 Spinifex community on 'Kurrajong'



Mulga dominant area



White Cypress Pine dominant area

- Area 2 assessed was the property 'Kurrajong'. It had a very similar community to Area 1, consisting of the same dominant species however Area 1 had a more mature tree structure. The drive through Area 2 found it to be highly variable for maturity of structure, disturbance history and vegetation associations.

The site assessed was a highly disturbed multi-layered low open forest dominated by Silver-leaf Ironbark and White Cypress Pine regrowth all < 20cm dbh. Occasional Mulga (*Acacia aneura*) and Bimble box (*E. populnea* subsp. *bimbil*) were also scattered throughout. A sparse layer of tall shrubs was often present below these trees and included Wild lemon (*Canthium oleifolium*) and Wilga (*Geijera parviflora*). A low sparse shrub layer was exclusively dominated by Galvanised burr (*Sclerolaena birchii*). The sparse grass layer < 10%, mostly consisted of mature tussocks of Buck spinifex (*Triodia mitchellii*) and, less commonly, Five-minute Grass (*Tripogon lolliformis*). Herbs were generally sparse with Musky Sunray (*Rhodanthe moschata*) being the only common species. 10% of the ground cover was litter (mostly dead spinifex), and the remainder was bare red sandy soil.

Thirty eight species of plants were recorded as shown in Appendix 1, none of those were exotics, fifteen of those were only recorded in the Spinifex community, one of those is a threatened orchid *Diuris tricolor*.

Other areas observed whilst driving, but not assessed, were less disturbed examples of the same community having a mature structure, and/or diverse shrub layers, and/or associations dominated by Mulga or Bimble Box.

4-2. Box Hollows

Two areas were assessed and described, and found to be very similar in species composition.

- Area 3 is a mixed age Bimble Box woodland/open woodland in a hollow or depression, which has been partially disturbed by clearing, and grazing. White Cypress Pine and Silver-leaved Ironbark were uncommon in the hollow, but dominant in the surrounding vegetation. Tall shrubs were sparse (few Wilga), however low shrubs of Galvanised burr were common. Overall grass and herb ground cover was a sparse 10%, with the exception of a few small dense sections of Purple lovegrass (*Eragrostis lacunaria*). Litter was also sparse 10%, bare light grey loamy soil dominated the ground surface. Large hollow trees were occasional, as were large logs and dead trees. Thirty four species of plants were recorded, as shown in Appendix 1; six of those were only recorded at Area 3. One Sedge *Cyperus sp.* may prove to be a threatened species when it matures enough to be confident of the identification.

Area 3 Box Hollow



Area 4 'Barfield' Box Hollow



- Area 4 is regrowth Bimble Box woodland which has been severely affected by dieback, average tree size is <15cm dbh. White Cypress and Silver-leaf Ironbark are sparsely present in the hollow and dominant in the surrounds.

Shrubs were generally rare (few Wilga) with the notable exception of Galvanised burr which was abundant. The grass layer had small dense sections of Purple lovegrass (*Eragrostis lacunaria*) being the dominant species. In lesser numbers were small patches of Five-minute grass and Mulga grass (*Thyridolepis mitchelliana*).

Forty one species of plants were recorded, as shown in Appendix 1; fourteen of those were only recorded at Area 4. One Sedge *Cyperus sp.* may prove to be a threatened species when it matures enough to be confident of the identification.

A diverse herb layer was present in both hollows with the most common species being Stonecrop (*Crassula colorata*), Sago-weed (*Plantago cunninghamii*), Small monkey flower (*Mimulus prostratus*), Musky sunray, Wires and wool (*Lemooria burkittii*), Silky Goodenia (*Goodenia fascicularis*) and Sneezeweed (*Centipeda thespidioides*). Most of these plants prefer moist conditions and are a reflection of the impeded drainage of the hollows.

5-0. DISCUSSION

5-1. Flora species of conservation significance

A single species of conservation significance, the Long-tailed goat orchid (*Diuris tricolor*), was observed during the survey. It is listed as Vulnerable on the *NSW Threatened Species Conservation Act 1995* and the *Federal Environment Protection and Biodiversity Conservation Act 1999* and was considered “poorly known” by Briggs & Leigh (1996).

Two flowering plants were recorded in the spinifex community at Area 2, at AMG: Zone 55, Easting: 558729, Northing: 6712674, and a third individual plant was seen a further 150m south west along the road in a Mulga dominated area. The Long-tailed goat orchid is a widespread but uncommon species usually found much further east. This is possibly the most westerly occurrence of this threatened orchid species in the northern half of the state.

Both of the Box Hollow sites had small numbers of a species of *Cyperus* which could potentially be the threatened *Cyperus conicus*. Due to the dry conditions and unsuitable timing (sedges usually flower and fruit in late spring and summer) it was not possible to identify the sedge below the genus level. Observations by the botanist (L. Copeland) of *Cyperus conicus* last summer near Narrabri, however, suggest that the infertile leaves of the Glengarry plants look extremely similar to *Cyperus conicus* and it is quite likely that they will prove to be this species.

Several other threatened plant species could potentially occur in the Glengarry area, and are listed in Table 2. This list is based on a review of the literature and personal experience of L. Copeland.



Long-tailed goat orchid (*Diuris tricolor*) recorded in Spinifex community Area 2

Table 2. Threatened plant species potentially occurring in Glengarry area

Species	Notes
<i>Cyperus conicus</i>	Widespread to the east of the area and potentially occurring in the moister areas around Glengarry e.g. Box hollow communities.
<i>Goodenia macbarronii</i>	Widespread to the east of the area but potentially occurring in the moister areas around Glengarry e.g. Box hollow communities.
<i>Ipomoea diamantinensis</i>	Mostly to the west of the area but potentially occurring in the moister areas around Glengarry e.g. Box hollow communities.
<i>Lepidium monoplocoides</i>	A widespread species potentially occurring in the moister areas around Glengarry e.g. Box hollow communities.
<i>Swainsona murrayana</i>	A widespread species potentially occurring in the moister areas around Glengarry e.g. Box hollow communities.
<i>Pimelea elongata</i>	Generally occurs further west but potentially occurring in the moister areas around Glengarry.
<i>Polygala linariifolia</i>	A widespread species potentially occurring in the moister, sandier areas around Glengarry.

5-2. Fauna species of conservation significance

There are no threatened fauna species endemic to, or totally dependent on the habitats of Spinifex and Box Hollows as described in this report. However there are fourteen threatened species (listed below) which would utilise both communities as part of their habitat requirements.

The species most dependent on the habitats and resources provided by these communities are common species; for the species at their eastern limit the habitat present enables them to occur. The quality and quantity of the two habitats discussed will largely determine the abundance of the common and threatened species known and likely to occur.

The following species listed as Vulnerable in the *NSW Threatened Species Conservation Act 1995* were observed in the locality during the assessment; Grey-crowned Babbler, Glossy Cockatoo, and Major Mitchell Cockatoo. An additional eleven species are known to occur, shown in Table 3.

Table 3. Threatened fauna species known, likely and possibly occurring in the Cumborah locality (known by NWES)

Common Name	Scientific Name	Status	Occurrence
Red-tailed Black Cockatoo	<i>Calyptorhynchus banksii</i>	Vulnerable	Known
Glossy Black Cockatoo	<i>Calyptorhynchus lathami</i>	Vulnerable	Known
Major Mitchell Cockatoo	<i>Cacatua leadbeateri</i>	Vulnerable	Known
Superb Parrot	<i>Polytelis swainsonii</i>	Vulnerable	Possibly
Bourke's Parrot		Vulnerable	Possibly
Black-chinned Honeyeater	<i>Melithreptus gularis</i>	Vulnerable	Likely
Painted Honeyeater	<i>Grantiella picta</i>	Vulnerable	Known
Pied Honeyeater	<i>Certhionyx variegatus</i>	Vulnerable	Known
Hooded Robin	<i>Melanodryas cucullata</i>	Vulnerable	Known
Grey-crowned Babbler	<i>Pomatostomus temporalis</i>	Vulnerable	Known
Barking Owl	<i>Ninox connivens</i>	Vulnerable	Known
Grass Owl	<i>Tyto capensis</i>	Vulnerable	Possibly
Bush Stone Curlew	<i>Burhinus grallarius</i>	Endangered	Known
Australian Bustard	<i>Ardeotis australis</i>	Endangered	Possibly
Grey Falcon	<i>Falco hypoleucos</i>	Vulnerable	Possibly
Square-tailed Kite	<i>Lophoictinia isura</i>	Vulnerable	Possibly
Blue-billed Duck	<i>Oxyura australis</i>	Vulnerable	Likely
Freckled Duck	<i>Stictonetta naevosa</i>	Vulnerable	Likely
Brolga	<i>Grus rubicundus</i>	Vulnerable	Likely
Black-necked Stork	<i>Ephippiorhynchus asiaticus</i>	Endangered	Likely
Painted Snipe	<i>Rostratula benghalensis</i>	Vulnerable	Likely

Common Name	Scientific Name	Status	Occurrence
Kultarr	<i>Antechinomys laniger</i>	Endangered	Possibly
Koala	<i>Phascolarctos cinereus</i>	Vulnerable	Known
Strip-faced Dunnart	<i>Sminthopsis macroura</i>	Vulnerable	Likely
Greater Long-eared Bat	<i>Nyctophilus timoriensis</i>	Vulnerable	Known
Inland Forest Bat	<i>Vespadelus baverstocki</i>	Vulnerable	Known
Little Pied Bat	<i>Chalinolobus picatus</i>	Vulnerable	Known
Yellow-bellied Sheathtail Bat	<i>Saccolaimus flaviventris</i>	Vulnerable	Known
Beccari's Freetail Bat	<i>Mormopterus beccari</i>	Vulnerable	Likely
Hairy-nosed Freetail Bat	<i>Mormopterus sp 6</i>	Endangered	Likely

5-3. Significance of Box Hollows

This community dominated by Bimble Box trees is limited to small area depressions throughout the proposed mining area. The cause of the depressions which form shallow natural dams is unknown. The soil in the hollows has sufficient clay content to impede deep drainage; hence shallow ponding occurs after heavy rain events.

There appears to have been no research of the conservation value of Box Hollows to reference in this case. Consequently, this assessment uses ecological principles, and the observations and experience of NWES working in the region, to describe their value.

As such, the conservation value per hectare of Box Hollows is considered to be greater than other communities, even though their total area is very small, much smaller than the 4,790 ha of Spinifex.

For the majority of time when dry, they may be of no more value than any other habitat, however for those short wet periods their contribution to the replenishment and maintenance of the ridge ecosystem, is likely to be critical to the maintenance of the overall species composition and ecological balance.

Studies of flora and fauna diversity and abundance surrounding artificial water points by Landsberg et al. (1997), found water points do influence species diversity and abundance in the landscape, an influence which diminishes with distance away from the water points. "At sites adjacent to the water points, between 15-38% of species groups declined in abundance relative to remote sites. Additionally, between 10-33% of species groups increased in abundance at sites adjacent to water points relative to remote sites.

A range of taxonomic groups were examined in the study by including over-storey plants, under-storey plants, plants in the soil seed-bank, birds, reptiles, small mammals, and several invertebrate groups.

Being natural ephemeral dams, the history of influence of Box Hollows must have been an important part of the evolution of the plants and animals present. Hence their overall contribution to conservation cannot be under valued.

It is likely that rainfall and the subsequent water availability in depressions, provides a major cue to stimulate breeding activity for many species of fauna. The duration and success of those breeding events is probably strongly influenced by the amount of retained surface water.

A feature of semi arid areas is the adaptation of many invertebrates to lay dormant as eggs, and some frogs go into a torpor buried in the soil of ephemeral water depressions to survive dry times. Sometimes a single storm event is sufficient for the invertebrate eggs to hatch, and adult frogs to emerge, beginning the whole life cycle again.

At those times the productivity of small depressions is astounding. The abundant supply of frogs, shrimps, and larval forms of many insects stimulates a breeding response right up the food chain for all predators. Those events are likely to be utilised by numerous waterbirds including significant JAMBA & CAMBA migratory species.

Box Hollows are also likely to be valuable foraging areas for waterbirds during major bird breeding events on the nearby lakes.

Appendix 2 identifies five TSC Act listed Vulnerable waterbirds and eight migratory and threatened waterbirds listed in the EPBC Act which occur in the region. Each of those species may utilise Box Hollows during suitable seasons.

Appendix 4 identifies the frogs known and likely to occur in the locality, and identifies those most likely to be dependent on Box Hollows for breeding. Twelve species have been observed breeding in depressions such as the Box Hollows, at least ten species would bury themselves in the soil of the depressions as the water dries up. Some species of frogs are unlikely to breed on the floodplain during flooding events; for those species the Box Hollow depressions may be critical to their survival.

Tree hollows in the Bimble Box trees provide important nesting and roosting habitat for birds and bats, and the open spaces of the depressions are important insect foraging areas for bats, particularly when they contain water.

Four species of bats; Greater Long-eared Bat, Little Pied Bat, Inland Eptesicus, and Yellow-bellied Sheath-tail Bat are known to occur in the locality and roost in tree hollows such as those found in the Box Hollows inspected. Two other threatened bats that also roost in tree hollows may occur; Hairy-nosed Freetail Bat and Beccari's Freetail Bat.

Threatened birds that are likely to nest in the trees of Box Hollows are; Glossy Black Cockatoo, Major Mitchell Cockatoo, Superb Parrot, Bourke's Parrot, Black-chinned Honeyeater, Painted Honeyeater, Pied Honeyeater, Hooded Robin and Grey-crowned Babbler.

The results of this survey indicate that many plants may be limited to the shallow hollows, as twenty nine species (shown in Appendix 1) found in Box Hollows were not recorded in the Spinifex area. Further surveys of the surrounds are required to determine how restricted those plants are.

The plant of particular significance likely to occur and be restricted to moist depressions is *Cyperus conicus*. A *Cyperus* genus plant was identified in both Box Hollows, but unfortunately was too immature to be confidently identified. The botanist, Lachlan Copeland is familiar with that threatened plant, and feels confident time will identify it as *Cyperus conicus*. Table 2 identifies a further six threatened plants likely to occur in the Box Hollows. For that reason further survey work is recommended in a month's time.

5-4. Significance of Spinifex community

The ridge community is very different to the surrounding grassy open woodlands of the grey clay floodplains. Its diversity and density of vegetation, and its dry stony and sandy soil types provide habitats for many species which only occur on similar ridge communities.

This community has many vegetation and soil similarities with extensive areas of western NSW.

The flora survey of areas 1 and 2 found thirty eight species of plants, of which fifteen may be endemic to the Spinifex community, as they were not recorded elsewhere.

The plant of greatest significance was the orchid *Diuris tricolor* which was found at three locations in area 2. Lachlan Copeland advises that this finding is

particularly significant as this species has not been recorded west of Premer on the Liverpool Plains. Table 2 shows that two other threatened species may also occur; *Pimelea elongata*, and *Polygala linariifolia*. Hence it is recommended that further surveys be done to determine the extent of *Diuris tricolour*, and at the same time search for other significant species.

The Spinifex community occurring on deep red sand is considered significant because of its rich biodiversity (Maher et al. 1998), its unique species composition, and it provides important habitat for western fauna species at their easterly limit. Appendices 2, 3, 4, & 5 highlight the western species at the eastern limit of their range. No disjunct populations are known to occur, however it is highly likely that the large area of spinifex supports isolated populations of small reptiles (most likely are western *Ctenotus* species) and possibly small mammals. The cover provided by spinifex clumps is also of value as it provides shelter and protection from predators for numerous small mammals, reptiles and invertebrates. Many species also find the sandy soil beneath the clumps provides the ideal burrowing substrate.

Tree hollows in the Silver-leaf Ironbark trees provide important nesting and roosting habitat for birds and bats. Four species of bats; Greater Long-eared Bat, Little Pied Bat, Inland Eptesicus, and Yellow-bellied Sheath-tail Bat are known to occur in the locality and roost in tree hollows. Two other threatened bats that also roost in tree hollows may occur; Hairy-nosed Freetail Bat and Beccari's Freetail Bat.

Threatened birds that are likely to nest in the trees of Box Hollows are; Glossy Black Cockatoo, Major Mitchell Cockatoo, Superb Parrot, Bourke's Parrot, Black-chinned Honeyeater, Painted Honeyeater, Pied Honeyeater, Hooded Robin and Grey-crowned Babbler.

Because of its unique habitat and species composition it is highly desirable to include more of this community into dedicated conservation reserves.

6-0. CONCLUSION

The uniqueness of the communities discussed in this report, demonstrates they do play a significant role in the maintenance of the flora and fauna of the region. The quality and quantity of the habitats they provide will largely determine the abundance of the species present.

For that reason, it is recommended that the potential impacts of exploration drilling, and the subsequent impacts of opal mining, be carefully considered prior to further development in the area.

Potential impacts of exploration drilling in Box Hollows

- Loss of water holding capacity through deep drainage - could result in loss of breeding and foraging habitat for frogs, invertebrates, and water birds, and loss of plant species associated with ephemeral water ponding.
- Loss of hollow trees – clearing to enable vehicle access to drilling sites etc could remove important roosting and breeding habitats for hollow dependent fauna.
- Trampling and destruction of threatened plants.
- Displacement of species which normally would take advantage of ephemeral depressions when wet.
- Pollution of ephemeral water ponds and likely introduction of weeds.

Potential impacts of opal mining in Box Hollows

- Impacts of human presence should mining be viable – introduction of cats, dogs, and weeds, ground disturbance and clearing required for mining (as observed in current mining operations).
- Displacement of species which normally would take advantage of ephemeral resources when wet.
- Erosion and sedimentation pollution of ephemeral water ponds.
- Trampling and destruction of threatened plants, likely introduction of weeds.

Potential impacts of exploration drilling in Spinifex communities

- Trampling and destruction of threatened plants, and likely introduction of weeds.
- Loss of hollow trees – clearing to enable vehicle access to drilling sites etc could remove important roosting and breeding habitats for hollow dependent fauna.

Potential impacts of opal mining in Spinifex communities

- Impacts of human presence should mining be viable – introduction of cats, dogs, and weeds, ground disturbance and clearing required for mining (as observed in current mining operations).
- Trampling and destruction of threatened plants, and likely introduction of weeds.
- Displacement of species which normally utilise spinifex communities.
- Loss of hollow trees – clearing to enable vehicle access to drilling sites etc could remove important roosting and breeding habitats for hollow dependent fauna.

7-0. RECOMMENDATIONS

Given the significance of Box Hollows identified in this report, it is not recommended to permit drilling operations in them, nor is it recommended to allow mining and human habitation in their immediate proximity. To protect these areas a suitable buffer or exclusion zone should be enforced around all Box Hollows.

The Spinifex red ridge community has less significance, as it is far more extensive. However, it is under threat from Cypress Pine invasion, which is increasingly displacing native plants, causing erosion, and forming a monoculture. To reverse the situation the pine needs to be thinned to natural densities and the traditional fire regime re-established to prevent a recurrence of thick pine regrowth.



The community is also under threat from a diverse array of weeds, mostly cactus species.



It could be argued that the conservation values identified in this report will be lost without active intervention to reverse the above situation. Should mining go ahead one suitable compensatory measure to provide a conservation benefit, would be the reservation and active management of suitable areas of the spinifex community, where the weeds are controlled and the pine thinned to a natural density.

Identifying suitable areas for reservation could be based on protecting all areas where the threatened orchid occurs and is likely to occur. Further surveys for threatened plants are recommended to determine their extent, and the dimension of suitable habitat in the proposed mining area.

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APPENDIX 1.

Summary of flora recorded at the Spinifex Area 2, and Box Hollows Areas 3 and 4

Key; BH = Box Hollow, SP = Spinifex, B & S = plants at both Box Hollows & Spinifex

	Trees	Common Name	SP 1 & 2	BH 3	BH 4	BH only	SP only	B&S both
	<i>Acacia aneura</i>	Mulga	C	R				+
	<i>Brachychiton populneus</i> subsp. <i>trilobus</i>	Kurrajong	R				-	
	<i>Callitris glaucophylla</i>	White cypress pine	A	C	C			+
	<i>Canthium oleifolium</i>	Wild lemon	O				-	
	<i>Eremophila mitchellii</i>	Budda	R				-	
	<i>Eucalyptus melanophloia</i>	Silver-leaved ironbark	A	R	R			+
	<i>Eucalyptus populnea</i> subsp. <i>bimbil</i>	Bimbil box	R	A	A			+
	<i>Geijera parviflora</i>	Wilga	O	O	R			+
	<u>Mistletoes</u>							
	<i>Amyema quandang</i> var. <i>quandang</i>	Mistletoe	O				-	
	<u>Vines</u>							
	<i>Marsdenia viridiflora</i>	Native pear	R				-	
	<i>Parsonsia eucalyptophylla</i>	Gargaloo	R				-	
	<u>Shrubs</u>							
	<i>Dodonaea boroniifolia</i>	Hopbush	R				-	
	<i>Eremophila longifolia</i>	Emubush	R				-	
*	<i>Opuntia stricta</i> var. <i>stricta</i>	Prickly pear		R		-		
	<i>Pimelea neo-anglica</i>	Poison Pimelea	R	R	R			+
	<i>Salsola kali</i> var. <i>kali</i>	Roly-poly	R		R			+
	<i>Sclerolaena birchii</i>	Galvanised burr	A	C	A			+
	<i>Sclerolaena</i> sp.	Prickly saltbush	O	O	R			+
	<i>Senna artemisioides</i>	Silver Cassia	R		O			+
	<i>Solanum parvifolium</i>		R				-	
	<i>Solanum</i> sp.		R	R	R			+
	<i>Spartothamnella puberula</i>	Beadbush	R		O			+
	<i>Teucrium racemosum</i>	Grey Germander			R	-		
	<u>Herbs</u>							
	<i>Actinobole uliginosum</i>	Flannel cudweed			C	-		
	<i>Actinobole uliginosum</i>	Flannel cudweed		O		-		
	<i>Brachycome</i> sp.	Daisy			O	-		
	<i>Brachycome</i> sp.	Daisy		O		-		
	<i>Bulbine</i> sp.	Bulbine lily	R	O	O			+
	<i>Calandrinia</i> sp.	Purslane	O	R	C			+
	<i>Calotis cuneifolia</i>	Purple Burr-daisy			O	-		

	Trees	Common Name	SP 1 & 2	BH 3	BH 4	BH only	SP only	B&S both
	<i>Centipeda thespidioides</i>	Sneezeweed			C	-		
	<i>Chamaesyce drummondii</i>	Caustic weed			R	-/		
	<i>Cheilanthes sieberi</i>	Mulga fern	O	O				+
	<i>Chrysocephalum apiculatum</i>	Clustered everlasting	R				-	
	<i>Crassula colorata</i>	Stonecrop	O	C				+
	<i>Crassula colorata</i>	Stonecrop			A	-		
	<i>Cyperus</i> sp.	Sedge		R	R	-		
	<i>Daucus glochidiatus</i>	Native carrot		O	C	-		
	<i>Diuris tricolor</i>	Long-tailed goat orchid	R				-	
	<i>Einadia nutans</i>	Climbing saltbush	R				-	
	<i>Erodium crinitum</i>	Blue Storksbill			O	-		
	<i>Gnephosis tenuissima</i>	Dwarf cup-flower		R		-		
	<i>Goodenia fascicularis</i>	Silky Goodenia		C	R	-		
	<i>Goodenia glabra</i>	Smooth Goodenia	O	O	R			+
	<i>Lemooria burkittii</i>	Wires and wool		C		-		
	<i>Lotus cruentus</i>	Red-flowered Lotus			R	-		
	<i>Marsilea</i> sp.	Nardoo			R	-		
	<i>Mimulus prostratus</i>	Small monkey flower		A	A	-		
	<i>Nicotiana</i> sp.	Native tobacco			R	-		
	<i>Oxalis perennans</i>	Soursob	O	R				+
	<i>Pimelea trichostachya</i>	Spiked rice-flower		O	R	-		
	<i>Plantago cunninghamii</i>	Sago-weed			A	-		
	<i>Rhodanthe moschata</i>	Musky sunray	C	A	A			+
	<i>Rhodanthe</i> sp.	Sunray		O		-		
	<i>Sida cunninghamii</i>	Ridge Sida	R	R	O			+
	<i>Sida</i> sp.		R		R			+
*	<i>Sisymbrium orientale</i>	Indian hedge mustard			O	-		
	<i>Swainsona affinis</i>	Darling pea		O	R	-		
	<i>Trachymene</i> sp.	Native parsnip		O	R	-		
	Grasses							
	<i>Aristida</i> sp.	Wiregrass	R	O				+
	<i>Cenchrus</i> sp.		R				-	
	<i>Eragrostis</i> sp.	Lovegrass	R				-	
	<i>Eragrostis lacunaria</i>	Purple lovegrass		A	A	-		
	<i>Thyridolepis mitchelliana</i>	Mulga grass		C	R	-		
	<i>Triodia mitchellii</i>	Buck spinifex	A				-	
	<i>Tripogon lolliformis</i>	Five-minute grass	O	C	A			+
	<i>Tragus australianus</i>	Burrgrass			R	-		

APPENDIX 2.
BIRD SPECIES RECORDED -10th September 2006,
AND OTHER BIRDS KNOWN, AND LIKELY TO OCCUR IN THE
LIGHTNING RIDGE – CUMBORAH AREA

Key: R = recorded this survey, V = Vulnerable in TSC Act 1995, E = Endangered TSC Act,
 K = recorded previously, EPB = migratory or threatened species listed in Environment
 Protection Biodiversity Conservation Act 1999

WL = western limit, EL = eastern limit, SL = southern limit, NL = northern limit

Sp code	Species Name	Status	Records	Distribution	Sp code	Species Name	Status	Records	Distribution
0009	Stubble Quail				0295	Red-rumped Parrot		K	
0019	Red-chested Button Quail				0256	Scaly-breasted Lorikeet			WL
0010	Brown Quail				0254	Rainbow Lorikeet			WL
0018	Little Button Quail				0338	Fan-tailed Cuckoo		K	
0014	Painted Button Quail				0342	Horsefield's Bronze Cuckoo		K	
					0377	Jacky Winter		R	
0034	Common Bronzewing		K		0381	Red Capped Robin		R	
0043	Crested Pigeon		K		0385	Hooded Robin	V	K	
0030	Peaceful Dove		K		0392	Eastern Yellow Robin			WL
0032	Bar-shouldered Dove		R		8388	Grey-crowned Babbler	V	R	
0031	Diamond Dove		K		0445	White-browed Babbler		K	
0264	Red-tailed Black Cockatoo	V	K	SL	0549	Varied Sittella			
0273	Galah		K		0416	Crested Shrike-tit			WL
0269	Sulphur-crested Cockatoo			WL	0419	Crested Bellbird		R	
0265	Glossy Black Cockatoo	V	K	WL	0430	White winged Triller		K	
0270	Major Mitchell Cockatoo	V	K	EL	0401	Rufous Whistler		R	
0297	Blue Bonnet		R		0408	Grey Shrike-Thrush		K	
0296	Mulga Parrot		K		0365	Leaden Flycatcher		K	WL
0274	Cockatiel		K		0369	Restless Flycatcher		K	
0271	Little Corella				0415	Magpie-Lark		R	
0291	Eastern Ringneck		R		0361	Grey Fantail		K	
0280	Red-winged Parrot		R		0364	Willie Wagtail		R	
0304	Bourke's Parrot	V		EL	0424	Black-faced Cuckoo-shrike		R	
0277	Superb Parrot	V		NL	0423	Ground Cuckoo-shrike			
0310	Budgerigar		K		0425	Little Cuckoo-shrike		K	
0286	Pale-headed Rosella		K						

Sp code	Species Name	Status	Records	Distribution	Sp code	Species Name	Status	Records	Distribution
0337	Pallid Cuckoo		K		0671	Olive-backed Oriole			
0341	Black-eared Cuckoo		K		0702	Grey Butcherbird		R	
0322	Laughing Kookaburra		K		0700	Pied Butcherbird		K	
0325	Red Backed Kingfisher			EL	0705	Magpie		R	
0326	Sacred Kingfisher		K		0691	Little Crow			EL
0329	Rainbow Bee-eater	EPB	K		0930	Australian Raven		R	
0318	Dollarbird			WL	0692	Torresian Crow			
0532	Splendid Fairy Wren		R	EL	0693	White-winged Chough		K	
0535	White-wing Fairy wren				0675	Apostlebird		R	
0529	Superb Blue Wren			WL	0680	Spotted Bowerbird		K	
0536	Variegated Blue Wren		K		0648	Singing Bushlark			
0498	Chestnut-rumped Heathwren			WL	0647	Richard's Pipit		K	
0555	Brown Treecreeper		R		0655	Double-barred Finch		R	
0561	White-browed Treecreeper				0653	Zebra Finch		K	
0565	Spotted Pardalote				0661	Plum Headed Finch		K	
0976	Striated Pardalote		R		0652	Diamond Finch	V		WL
0570	Red-browed Pardalote				0564	Mistletoebird		R	
0465	Weebill		R		0357	Welcome Swallow			
0463	Western Gerygone		R		0358	White-backed Swallow			
0453	White-throated Gerygone			WL	0359	Tree Martin		K	
0481	Chestnut-rumped Thornbill		R		0360	Fairy Martin			
0484	Buff-rumped Thornbill		K		0509	Rufous Songlark		K	
0476	Inland Thornbill				0508	Brown Songlark			
0486	Yellow-rumped Thornbill		K		0525	Golden-headed Cisticola			WL
0471	Yellow Thornbill		K		0522	Little Grassbird		K	
0466	Southern Whiteface		K		0523	Tawny Grassbird			WL
0544	Masked Woodswallow				0449	Crimson Chat		K	
0548	Little Woodswallow		K		0448	White-fronted Chat			NL
0545	White-browed Woodswallow		K						
0543	White-breasted Woodswallow		K						
0546	Black-faced Woodswallow								
0547	Dusky Woodswallow								
0640	Spiny-cheek Honeyeater		R		0228	Whistling Kite		K	

Sp code	Species Name	Status	Records	Distribution	Sp code	Species Name	Status	Records	Distribution
0585	Striped Honeyeater		R		0229	Black Kite			
0645	Noisy Friarbird				0230	Square-tailed Kite	V		
0646	Little Friarbird		K						
0634	Noisy Miner			WL					
0635	Yellow-throated Miner		R		0134	Masked Lapwing		K	
0614	Yellow-faced Honeyeater				0234	Banded Lapwing			
0608	Singing Honeyeater		K		0177	Brolga	V	K	
0580	Black-chinned Honeyeater	V			0176	Australian Bustard	E	K	
0625	White-plumed Honeyeater		K		0174	Bush Stone Curlew	E	K	
0583	Brown-headed Honeyeater		R		0183	Black-necked Stork	V		
0598	Painted Honeyeater	V	K						
0594	White-fronted Honeyeater			EL	0249	Barn Owl			
0589	Black Honeyeater			EL	0242	Southern Boobook Owl		K	
0602	Pied Honeyeater	V	K	EL	0313	Tawny Frogmouth			
0597	Brown Honeyeater				0317	Owlet Nightjar		K	
0641	Blue-faced Honeyeater		K		0331	Spotted Nightjar		K	
					0246	Barking Owl	V		
0226	White-bellied Sea-Eagle	EPB	K		0252	Grass Owl	V		
0221	Brown Goshawk		K		0334	Spine-tailed Swift	EPB		
0222	Collared Sparrowhawk				0335	Fork-tailed Swift			
0223	Red Goshawk				0872	Reed Warbler			
0224	Wedge-tailed Eagle		K		0999	Common Starling			
0225	Little Eagle				0001	Emu		R	
0239	Brown Falcon		K		0574	Silvereeye			WL
0238	Black Falcon				0994	Sparrow			
0237	Peregrine Falcon								
0236	Grey Falcon	V							
0235	Australian Hobby								
0240	Nankeen Kestrel		K						
0233	Letter-winged Kite								
0232	Black Shouldered Kite		K						
0218	Spotted Harrier								
0219	Swamp Harrier								
0112	Caspian Tern	EPB	K		0178	Glossy Ibis	EPB	K	
0111	Gull-billed Tern				0179	Sacred Ibis			

Sp code	Species Name	Status	Records	Distribution	Sp code	Species Name	Status	Records	Distribution
0162	Red-necked Stint	EPB	K		0180	Straw-necked Ibis		K	
					0181	Royal Spoonbill			
0161	Curlew Sandpiper				0182	Yellow-billed Spoonbill		K	
0163	Sharp-tailed Sandpiper				0062	Hoary-headed Grebe			
0154	Wood Sandpiper				0061	Australasian Grebe		K	
0159	Marsh Sandpiper	EPB	K						
0157	Common Sandpiper	EPB	K		0106	Pelican			
0158	Common Greenshank	EPB	K		0101	Darter			
					0096	Great Cormorant			
0202	Wood Duck		R		0099	Pied Cormorant			
0208	Pacific Black Duck		K		0097	Little Black Cormorant			
0211	Grey Teal		K		0100	Little Pied Cormorant		K	
0212	Australian Shoveler								
0214	Freckled Duck	V	K		0055	Black-tailed Native Hen			
0217	Musk Duck				0059	Eurasian Coot			
0205	Plumed Whistling Duck		K		0056	Dusky Moorhen			
0213	Pink-eared Duck		K		0058	Purple Swamphen			
0215	Hardhead Duck				0143	Red-capped Plover			
0216	Blue-billed Duck	V	K		0144	Black-fronted Dotterel		K	
					0132	Red-kneed Dotterel			
0203	Black Swan								
0189	Pacific Heron		K		0146	Black-winged Stilt		K	
0188	White-faced Heron		K		0173	Australian Pratincole			EL
0187	Great Egret	EPB	K		0148	Red-necked Avocet			
0152	Black-tailed Godwit	V	K		0170	Painted Snipe	V	K	
0197	Australasian Bittern	V			0168	Latham's Snipe	EPB		
0185	Little Egret								
0186	Intermediate Egret								
0192	Rufous Night Heron								

APPENDIX 3.

REPTILE SPECIES RECORDED, KNOWN, AND LIKELY TO OCCUR IN THE CUMBORAH LOCALITY

Key: V = Vulnerable TSC Act 1995, R = recorded this survey, K = recorded previously by NWES

WL = western limit, EL = eastern limit, SL = southern limit, NL = northern limit

Sp code	Species Name	Common Name	Status	Records	Distribution
	GECKOES				
2077	<i>Diplodactylus vittatus</i>	Eastern Stone Gecko			
2078	<i>Strophurus williamsi</i>	Eastern Spiny-tailed Gecko		R	
2059	<i>Strophurus intermedius</i>	Southern Spiny-tailed Gecko			EL
2071	<i>Diplodactylus steindachneri</i>	Box Patterned Gecko		K	
2076	<i>Diplodactylus tessellatus</i>	Tessellated Gecko		K	
2119	<i>Oedura marmorata</i>	Marbled Velvet Gecko		K	EL
2082	<i>Gehyra dubia</i>	Dubious Dtella		R	
2092	<i>Gehyra variegata</i>	Common Dtella		K	
2105	<i>Heteronotia binoei</i>	Prickly Gecko		R	
2137	<i>Rhynchoedura ornata</i>	Beaked Gecko		K	
2138	<i>Underwoodisaurus milii</i>	Thick-tailed Gecko			
	SKINKS				
2375	<i>Ctenotus robustus</i>	Robust Ctenotus			
2392	<i>Ctenotus allotropis</i>				EL
2342	<i>Ctenotus brachyonyx</i>				EL
2511	<i>Ctenotus ingrami</i>				
2374	<i>Ctenotus regius</i>	Royal Ctenotus			EL
2379	<i>Ctenotus schomburgkii</i>				EL
2429	<i>Egernia striolata</i>	Tree Skink		K	
2438	<i>Eremiascincus richardsonii</i>	Broad-banded Sand-swimmer		K	
2475	<i>Lerista bougainvillii</i>				WL
2492	<i>Lerista muelleri</i>	Three-toed Lerista		K	
2499	<i>Lerista punctatovittata</i>	Spotted Lerista			
2326	<i>Cryptoblepharus carnabyi</i>			K	
2519	<i>Menetia greyii</i>				
2526	<i>Morethia boulengeri</i>	Boulenger's morethia		R	
2537	<i>Proablepharus kinghorni</i>	Kinghorn's Skink			EL
2580	<i>Tiliqua scincoides</i>	Common Blue Tongue		K	
2583	<i>Trachydosaurus rugosus</i>	Shingle-back Lizard			
	LEGLSS LIZARDS				
2170	<i>Lialis burtonis</i>	Burtons Snake Lizard			
2160	<i>Delma inornata</i>	Plain Snake Lizard		K	
2165	<i>Delma tinca</i>	Painted Snake Lizard			
2175	<i>Pygopus nigriceps</i>	Eastern Hooded Scaly-foot			
2174	<i>Pygopus lepidopodus</i>	Common Scaly-foot			

Sp code	Species Name	Common Name	Status	Records	Distribution
	DRAGONS				
2195	<i>Amphibolurus nobbi</i>	Nobbi Dragon			
2246	<i>Amphibolurus burnsi</i>	Burns Dragon		K	
2177	<i>Pogona barbata</i>	Eastern Bearded Dragon		K	
2257	<i>Tympanocryptis tetraporophora</i>	Four-pored Earless Dragon			
	GOANNAS				
2283	<i>Varanus varius</i>	Lace Monitor			
2271	<i>Varanus gouldii</i>	Sand Goanna		K	
2282	<i>Varanus tristis</i>	Freckled Monitor			
	SNAKES				
	Blind Snakes				
2585	<i>Ramphotyphlops affinis</i>	Small-headed Blind Snake			EL
2588	<i>Ramphotyphlops bituberculatus</i>	Prong-snouted Blind Snake			
2597	<i>Ramphotyphlops ligatus</i>			K	
2606	<i>Ramphotyphlops wiedii</i>				WL
	Pythons				
2969	<i>Morelia spilota metcalfei</i>			K	
	Colubrid Snake				
2633	<i>Dendrelaphis punctulata</i>	Green Tree Snake			WL
	Small Elapid Snakes				
2655	<i>Demansia psammophis</i>	Yellow-faced Whip Snake			WL
2660	<i>Denisonia devisi</i>	Devi's Banded Snake		K	WL
2669	<i>Furina diadema</i>	Red-naped Snake			
2726	<i>Suta dwyeri</i>	Dwyer's Black-headed Snake			
2734	<i>Vermicella annulata</i>	Bandy Bandy			
2675	<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V		WL
2722	<i>Suta suta</i>	Curl Snake		K	
2711	<i>Brachyurops australis</i>	Australian Coral Snake			
2673	<i>Hemiaspis damelii</i>	Grey Snake			WL
	Large Elapid Snakes				
2692	<i>Pseudechis guttatus</i>	Blue-bellied Black Snake			WL
2693	<i>Pseudechis porphyriacus</i>	Red-bellied Black Snake			WL
2699	<i>Pseudonaja textilis</i>	Eastern Brown Snake			
2690	<i>Pseudechis australis</i>	Mulga Snake		K	
2698	<i>Pseudonaja nuchalis</i>	Western Brown Snake			



Boulenger's Morethia - *Morethia boulengeri*



Three-toed Lerista - *Lerista muelleri*



Eastern Spiny-tailed Gecko - *Strophurus williamsi*



Prickly Gecko - *Heteronotia binoei*

APPENDIX 4.

FROG SPECIES RECORDED, KNOWN, AND LIKELY TO OCCUR IN THE CUMBORAH LOCALITY. IDENTIFIES SPECIES MOST LIKELY TO BE DEPENDENT ON BOX HOLLOW

Key: K = known, previously recorded by NWES

WL = western limit, EL = eastern limit, SL = southern limit, NL = northern limit

Sp code	Species Name	Common Name	Records	Breeds Flooded Floodplain	Breeds Small Ponds	Distribution
3024	<i>Cyclorana novaehollandiae</i>	Wide-mouth Frog	K	?	YES	SL
3025	<i>Cyclorana platycephala</i>	Waterholding Frog	K	YES	?	
3026	<i>Cyclorana verrucosa</i>	Warty Waterholding Frog	K	YES	?	
3165	<i>Litoria alboguttata</i>	Striped Burrowing Frog	K	YES	?	
3171	<i>Litoria caerulea</i>	Green Tree Frog	K	?	YES	
3191	<i>Litoria latopalmata</i>	Broad-palmed Frog	K	?	YES	
3204	<i>Litoria peronii</i>	Peron's Tree Frog	K	?	YES	
3210	<i>Litoria rubella</i>	Desert Tree Frog	K	YES	YES	
3131	<i>Crinia parinsignifera</i>	Brown Froglet		?	YES	
3134	<i>Crinia signifera</i>	Brown Froglet		?	YES	
3135	<i>Crinia sloanei</i>	Brown Froglet	K	?	YES	NL
3059	<i>Limnodynastes fletcheri</i>	Barking Marsh Frog	K	YES	YES	
3112	<i>Limnodynastes ornatus</i>	Ornate Burrowing Frog	K	?	YES	
3062	<i>Limnodynastes salmini</i>	Salmon-striped Frog	K	YES	?	
3063	<i>Limnodynastes tasmaniensis</i>	Spotted Grass Frog	K	YES	YES	
3086	<i>Neobatrachus sudelli</i>	Common Spadefoot Toad	K	YES	?	
3098	<i>Notaden bennettii</i>	Crucifix Frog	K	?	?	
3151	<i>Uperoleia rugosa</i>	Wrinkled Toadlet	K	?	YES	

APPENDIX 5.

MAMMALS RECORDED, KNOWN, AND LIKELY TO OCCUR IN THE CUMBORAH LOCALITY

Key: R = recorded this survey, K = recorded previously by NWES

V- listed as vulnerable under the *Threatened Species Conservation Act* (TSC Act) 1995;

F- not listed under the TSC Act (1995) but considered a conservation priority

WL = western limit, EL = eastern limit, SL = southern limit

Cavs Code	Scientific Name	Common Name	Status *	Records	Distribution
1003	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna		K	
1162	<i>Phascolarctos cinereus</i>	Koala	V	K	WL
1113	<i>Trichosurus vulpecula</i>	Common Brushtail Possum		K	
1138	<i>Petaurus breviceps</i>	Sugar Glider			WL
1147	<i>Acrobates pygmaeus</i>	Feathertail Glider			WL
1061	<i>Sminthopsis murina</i>	Common Dunnart			WL
1072	<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart		K	EL
1073	<i>Sminthopsis macroura</i>	Stripe-faced Dunnart	V		EL
1048	<i>Planigale tenuirostris</i>	Narrow-nosed Planigale			
1050	<i>Planigale gilesi</i>	Paucident Planigale			EL
1415	<i>Hydromys chrysogaster</i>	Water Rat			
1275	<i>Macropus rufus</i>	Red Kangaroo		R	
1265	<i>Macropus giganteus</i>	Eastern Grey Kangaroo		R	
1266	<i>Macropus robustus</i>	Common Wallaroo			
1242	<i>Wallabia bicolor</i>	Swamp Wallaby		R	
1263	<i>Macropus fuliginosus</i>	Western Grey Kangaroo			
1280	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V		WL
1281	<i>Pteropus scapulatus</i>	Little Red Flying-fox			
1324	<i>Nyctinomus australis</i>	White-striped Freetail Bat	F	K	
9045	<i>Mormopterus sp. 3 (small P)</i>	Un-named Freetail Bat		K	
9044	<i>Mormopterus sp. 4 (large P)</i>	Un-named Freetail Bat	F		
	<i>Mormopterus sp 6</i>	Hairy-nosed Freetail Bat	V		SL
1330	<i>Mormopterus beccarii</i>	Beccari's Freetail Bat	V		SL
1349	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat		K	
1352	<i>Chalinolobus picatus</i>	Little Pied Bat	V	K	
1379	<i>Vespadelus vulturnus</i>	Little Forest Bat		K	
1819	<i>Vespadelus baverstocki</i>	Inland Eptesicus	V		EL
1025	<i>Vespadelus trougtoni</i>	Eastern Cave Bat	V		WL
1321	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail Bat	V	K	
1362	<i>Scotorepens greyii</i>	Little Broad-nosed Bat		K	
1364	<i>Scotorepens balstoni</i>	Western Broad-nosed Bat		K	
1334	<i>Nyctophilus gouldi</i>	Gould's Long-eared Bat			WL
1335	<i>Nyctophilus geoffroyi</i>	Lesser long-eared Bat		K	
1332	<i>Nyctophilus timoriensis</i>	Greater Long-eared Bat	V		

FERAL MAMMALS RECORDED, KNOWN, AND LIKELY TO OCCUR IN THE CUMBORAH LOCALITY

Cavs Code	Scientific Name	Common Name	Status *	Records	Distribution
1408	<i>Rattus rattus</i>	Black Rat	I		
1412	<i>Mus musculus</i>	House Mouse	I		
1531	<i>Canis familiaris</i>	Dog (feral)	I		
1532	<i>Vulpes vulpes</i>	Fox (feral)	I	K	
1536	<i>Felis catus</i>	Cat (feral)	I	K	
1510	<i>Oryctolagus cuniculus</i>	Rabbit	I	R	
1514	<i>Sus scrofa</i>	Pig	I	R	
1521	<i>Capra hircus</i>	Goat	I	R	
1511	<i>Lepus capensis</i>	Brown Hare	I	K	

APPENDIX 6

FLORA SPECIES RECORDED By Dr Lachlan Copeland 10th September 2006

Abundance codes: a = abundant, c = common, o = occasional, r = rare

Area 2 'Kurrajong' Spinifex

<u>Trees</u>	<u>Common Name</u>	<u>Abundance</u>
<i>Acacia aneura</i>	Mulga	c
<i>Brachychiton populneus</i> subsp. <i>trilobus</i>	Kurrajong	r
<i>Callitris glaucophylla</i>	White cypress pine	a
<i>Canthium oleifolium</i>	Wild lemon	o
<i>Eremophila mitchellii</i>	Budda	r
<i>Eucalyptus melanophloia</i>	Silver-leaved ironbark	a
<i>Eucalyptus populnea</i> subsp. <i>bimbil</i>	Bimbil box	r
<i>Geijera parviflora</i>	Wilga	o
 <u>Mistletoes</u>		
<i>Amyema quandang</i> var. <i>quandang</i>	Mistletoe	o
 <u>Vines</u>		
<i>Marsdenia viridiflora</i>	Native pear	r
<i>Parsonsia eucalyptophylla</i>	Gargaloo	r
 <u>Shrubs</u>		
<i>Dodonaea boroniifolia</i>	Hopbush	r
<i>Eremophila longifolia</i>	Emubush	r
<i>Pimelea neo-anglica</i>	Poison Pimelea	r
<i>Salsola kali</i> var. <i>kali</i>	Roly-poly	r
<i>Sclerolaena birchii</i>	Galvanised burr	a
<i>Sclerolaena</i> sp.	Prickly saltbush	o
<i>Senna artemisioides</i>	Silver Cassia	r
<i>Solanum parvifolium</i>		r
<i>Solanum</i> sp.		r
<i>Spartothamnella puberula</i>	Beadbush	r
 <u>Herbs</u>		
<i>Bulbine</i> sp.	Bulbine lily	r
<i>Calandrinia</i> sp.	Purslane	o
<i>Cheilanthes sieberi</i>	Mulga fern	o
<i>Chrysocephalum apiculatum</i>	Clustered everlasting	r
<i>Crassula colorata</i>	Stonecrop	o
<i>Diuris tricolor</i>	Long-tailed goat orchid	r
<i>Einadia nutans</i>	Climbing saltbush	r
<i>Goodenia glabra</i>	Smooth Goodenia	o
<i>Oxalis perennans</i>	Soursob	o
<i>Rhodanthe moschata</i>	Musky sunray	c
<i>Sida cunninghamii</i>	Ridge Sida	r
<i>Sida</i> sp.		

Trees	Common Name	Abundance
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Grasses

<i>Aristida</i> sp.	Wiregrass	r
<i>Cenchrus</i> sp.		r
<i>Eragrostis</i> sp.	Lovegrass	r
<i>Triodia mitchellii</i>	Buck spinifex	a
<i>Tripogon lolliformis</i>	Five-minute grass	o



Spinifex community Area 2



Area 3 “Barfield” Box Hollow

	Trees	Common Name	Abundance
	<i>Acacia aneura</i>	Mulga	r
	<i>Callitris glaucophylla</i>	White cypress pine	c
	<i>Eucalyptus melanophloia</i>	Silver-leaved ironbark	r
	<i>Eucalyptus populnea</i> subsp. <i>bimbil</i>	Bimbil box	a
	<i>Geijera parviflora</i>	Wilga	o
	<u>Shrubs</u>		
*	<i>Opuntia stricta</i> var. <i>stricta</i>	Prickly pear	r
	<i>Pimelea neo-anglica</i>	Poison Pimelea	r
	<i>Sclerolaena birchii</i>	Galvanised burr	c
	<i>Sclerolaena</i> sp.	Prickly saltbush	o
	<i>Solanum</i> sp.		r
	<u>Herbs</u>		
	<i>Actinobole uliginosum</i>	Flannel cudweed	o
	<i>Brachycome</i> sp.	Daisy	o
	<i>Bulbine</i> sp.	Bulbine lily	o
	<i>Calandrinia</i> sp.	Purslane	r
	<i>Cheilanthes sieberi</i>	Mulga fern	o
	<i>Crassula colorata</i>	Stonecrop	c
	<i>Cyperus</i> sp.	Sedge	r
	<i>Daucus glochidiatus</i>	Native carrot	o
	<i>Gnephosis tenuissima</i>	Dwarf cup-flower	r
	<i>Goodenia fascicularis</i>	Silky Goodenia	c
	<i>Goodenia glabra</i>	Smooth Goodenia	o
	<i>Lemnooria burkittii</i>	Wires and wool	c
	<i>Mimulus prostratus</i>	Small monkey flower	a
	<i>Oxalis perennans</i>	Soursob	r
	<i>Pimelea trichostachya</i>	Spiked rice-flower	o
	<i>Rhodanthe moschata</i>	Musky sunray	a
	<i>Rhodanthe</i> sp.	Sunray	o
	<i>Sida cunninghamii</i>	Ridge Sida	r
	<i>Swainsona affinis</i>	Darling pea	o
	<i>Trachymene</i> sp.	Native parsnip	o
	<u>Grasses</u>		
	<i>Aristida</i> sp.	Wiregrass	o
	<i>Eragrostis lacunaria</i>	Purple lovegrass	a
	<i>Thyridolepis mitchelliana</i>	Mulga grass	c
	<i>Tripogon lolliformis</i>	Five-minute grass	c



Area 3 'Barfield' Box Hollow



Area 4 'Barfield' Box Hollow

Area 4 “Barfield” Box Hollow

<u>Trees</u>	Common Name	Abundance
<i>Callitris glaucophylla</i>	White cypress pine	c
<i>Eucalyptus melanophloia</i>	Silver-leaved ironbark	r
<i>Eucalyptus populnea</i> subsp. <i>bimbil</i>	Bimbil box	a
<i>Geijera parviflora</i>	Wilga	r
<u>Shrubs</u>		
<i>Pimelea neo-anglica</i>	Poison Pimelea	r
<i>Salsola kali</i> var. <i>kali</i>	Roly-poly	r
<i>Sclerolaena birchii</i>	Galvanised burr	a
<i>Sclerolaena</i> sp.	Prickly saltbush	r
<i>Senna artemisioides</i>	Silver Cassia	o
<i>Solanum</i> sp.		r
<i>Spartothamnella puberula</i>	Beadbush	o
<i>Teucrium racemosum</i>	Grey Germander	r
<u>Herbs</u>		
<i>Actinobole uliginosum</i>	Flannel cudweed	c
<i>Brachycome</i> sp.	Daisy	o
<i>Bulbine</i> sp.	Bulbine lily	o
<i>Calandrinia</i> sp.	Purslane	c
<i>Calotis cuneifolia</i>	Purple Burr-daisy	o
<i>Centipeda thespidioides</i>	Sneezeweed	c
<i>Chamaesyce drummondii</i>	Caustic weed	r
<i>Crassula colorata</i>	Stonecrop	a
<i>Cyperus</i> sp.	Sedge	r
<i>Daucus glochidiatus</i>	Native carrot	c
<i>Erodium crinitum</i>	Blue Storksbill	o
<i>Goodenia fascicularis</i>	Silky Goodenia	r
<i>Goodenia glabra</i>	Smooth Goodenia	r
<i>Lotus cruentus</i>	Red-flowered Lotus	r
<i>Marsilea</i> sp.	Nardoo	r
<i>Mimulus prostratus</i>	Small monkey flower	a
<i>Nicotiana</i> sp.	Native tobacco	r
<i>Pimelea trichostachya</i>	Spiked rice-flower	r
<i>Plantago cunninghamii</i>	Sago-weed	a
<i>Rhodanthe moschata</i>	Musky sunray	a
<i>Sida cunninghamii</i>	Ridge Sida	o
<i>Sida</i> sp.		
* <i>Sisymbrium orientale</i>	Indian hedge mustard	o
<i>Swainsona</i> sp.	Darling pea	r
<i>Trachymene</i> sp.	Native parsnip	r
<u>Grasses</u>		
<i>Eragrostis lacunaria</i>	Purple lovegrass	a
<i>Thyridolepis mitchelliana</i>	Mulga grass	r
<i>Tripogon lolliformis</i>	Five-minute grass	a
<i>Tragus australianus</i>	Burrgrass	r